An Examination of Task-Technology Fit in Public Administration and Management

A Configurational Approach

Patrick Mikalef
Department of Technology Management
SINTEF Digital
Trondheim, Norway
patrick.mikalef@sintef.no

Hans Yngvar Torvatn
Department of Technology Management
SINTEF Digital
Trondheim, Norway
hans.torvatn@sintef.no

***Abstract*— In spite of heavy investments in digital technologies in the public sector over the past couple of decades, one of the most important issues regarding the value realized from them is that in many cases he technologies used to support tasks of professionals are often not used as intended, or even not used at all. Apart from not perceiving any positive impacts, several studies have noted negative effects when professionals incorporate different novel technologies into their work tasks. Building the task-technology fit theory and based on a recent sample of 228 professionals working in Norwegian public administration and management bodies, this study uncovers the configurations of elements that lead to positive and negative impacts when using digital technologies to support work. We apply a fuzzy set qualitative comparative analysis (fsQCA) to demonstrate that there are several alternative configurations of tasks, technologies, and use practices that can either help produce positive impacts or create negative ones.**

Keywords*— *Task-technology fit, fuzzy-set qualitative comparative analysis, empirical study, IT value creation.

I. Introduction

In spite of heavy investments in digital technologies in the public administration and management domain over the past couple of decades [1], one of the prevailing issues is that in many cases he technologies used to support tasks of professionals are often not used as intended, or even not used at all [2]. In fact, several independent studies have documented that public administration professionals are reluctant to adopt newly introduced technologies, whether they are used to support core tasks, reporting and documenting, or for task coordination [3, 4]. When considering the large costs associated with developing and implementing such digital technologies in the public sector, as well as their potential to significantly improve professionals work performance, it comes as a surprise to see that there are still many professionals that chose to not adopt technologies in their work activities or who believe that their work is more efficient using conventional methods that do not involve ICT [5]. A number of studies have sought to explore this issue over the last few years, attempting to uncover the reasons why public administration professionals either do not use supporting technologies, or more why they experience negative impacts from incorporating them in their work practices [6]. While most studies have centred around the adoption of services provided to citizens, a much smaller proportion of attention has been attributed to examining if employees utilize the systems they are offered. Even more importantly, it is critical to examine whether such systems provide positive returns to their performance and if yes under what conditions.

Several different approaches have been applied in examining such effects and identifying their roots, nevertheless, a prominent perspective, that of task-technology fit, has been argued to be particularly suited in explaining how specific job-related tasks, aspects of the technology, as well as use practices coalesce to create fit, and subsequently positive impacts [7]. While the task-technology fit theory has received considerably greater attention in the broader IS domain, when looking into the public administration and management employees use of technology, studies have been much fewer, with very limited empirical examinations adopting this perspective. Furthermore, the vast majority of studies applying this perspective to uncover key success factors to fit, adopt a methodological approach that does not account for the diversity of use patterns and requirements of varied tasks that professionals need to deal with in their everyday work [8]. Recent work in the field of public administration technology adoption, and within the more general IS domain, favours the idea that there may exist several different ways by which technology can produce positive impacts to employees [9]. The main idea is that individuals in their work are faced with different tasks that they must complete, which necessitates different approaches to the use of technology, as well as specific adoption and diffusion practices to achieve expected outcomes.

Building on the foregoing discussion, the purpose of this study is to examine through a task-technology fit theoretical perspective, which are those combinations of tasks, technology, and individual use practices that fit together to contribute to positive impacts in the context of public administration professionals work. We draw on a recent large-scale empirical survey conducted with 228 professionals in the public sector domain, and by applying the novel methodological approach fuzzy set qualitative comparative analysis (fsQCA) uncover several different configurations that lead to either positive or negative impacts. In this way we are able to identify a series of different tasks, the aspects pertinent to technology that best fit task requirements, as well as individual use and adoption practices that facilitate optimal fit. Similarly, we highlight those that produce negative outcomes to professionals, as a means of demonstrating what should be avoided in practice. In the rest of the paper we discuss the background and related literature in the domain, introduce the method applied and the data that is analysed, followed by the results and a discussion on their implications.

II. Background

In order to examine how different digital technologies can contribute to positive and negative impacts of work

978-1-7281-0650-2/19/$31.00 ©2019 IEEE
DOI 10.1109/CBI.2019.00047

performance in the public administration and management sector we build on the task-technology fit theory [7]. The theory holds that digital technologies will have a higher probability of positively impacting individuals work performance when the capabilities they deliver can match the tasks individuals must perform. Ever since its inception the theory has been expanded in several ways, with latest literature recognizing the fact that individual use characteristics and the design and training practices surrounding adoption play a significant role on performance impacts of technology use [10]. The task-technology fit theory has subsequently been used at various levels of analysis, examining effects on individuals and groups [11, 12], as well as in many different contexts, from specific technologies [13] to effects on industries or particular professions [14]. Within the context of public administration, there have been some studies that examine factors that contribute to task-technology fit, and as a consequence perceived positive work-related outcomes [15]. These studies have been increasing over the past few years seeing the growing embeddedness of digital technologies in activities within the public sector. Now, more than ever, public administration employees are using digital technologies either due to governmental pressures [16], or to improve their work performance in a range of different tasks [17]. Yet, despite heavy investments and a strong move towards digitally-transforming tasks of public administration professionals, there still many that state that such digital technologies are becoming more of an obstacle rather than an aid in improving work [18].

Configurational approaches which are grounded on the tenets of complexity theories [19] have being growing in interest in the IS community over the past few years [20-22]. One of the main strengths of such approaches is that the allow for the possibility of multiple different paths, or solutions, that lead to an outcome of interest [23]. This means, that in the case of positive impacts of digital technology use in the public administration sector, it would be possible to detect several successful cases of using technologies to perform specific tasks, along with the individual use characteristics that describe them. The literature has documented some first studies following task-technology fit theory and configurational approaches in explaining optimal patterns for use of technologies [24]. Nevertheless, there is still very limited research in exploring how the different aspects pertinent to task, technology, and individual use coalesce to drive fit, and as a result positive impacts in the workplace. While the bulk of research building on the task-technology fit theory has focused predominantly on the two main concepts (i.e. task and technology) [25], a growing stream of research incorporates in the investigation the role of individuals and how technologies are deployed and routinized in work activities [26, 27]. In fact, more and more research is looking into the formal and informal mechanisms of adopting and routinizing the use of technologies in the workplace, acknowledging the fact that just as important as the technology itself to support a task are the practices through which they are embedded in work [28, 29]. This study therefore looks at the successful and non-successful patterns of task, technology and use of digital technologies in the workplace of public administration and management.

III. Method

A. Data Collection

To explore the configurations of elements pertinent to tasks, technology, and individual use context that lead to positive and negative impacts in the work environment, a survey instrument was developed. The survey-based approach is regarded as an appropriate method to accurately capture the use of technologies, and beliefs and attitudes of individuals in the work environment, and also specifically in the public administration sector [30]. According to Straub, et al. [31], the survey-based method is based suited in exploratory settings and predictive theory. To develop the respective constructs, we utilized a 5-point Likert scale, which is regarded as an appropriate method where no standard measures exist for quantifying notions such as attitudes and beliefs [32]. To make sure that the measures were reliable and valid, a pilot study was conducted the year before the main study (i.e. in 2016) gathering responses from approximately 1ooo individuals in Norway working in different sectors. This pilot study enabled us to assess the content validity of items, and to ensure that all questions were easily understood. For the main study, a representative population following the level 1 of NACE Classification Codes (Nomenclature des Activités Économiques dans la Communauté Européenne) was selected within Norway, and a list of individuals within each industry was constructed following a representative sample based on job type. The goal was to collect data from a diverse but balanced sample of individuals working in Norway and using digital technologies to support their work.

A professional data collection company was commissioned with conducting phone polls to individuals throughout Norway using a database of approximately 10.000 individuals in a variety of different industries, including those of public administration sector. The callers informed participants about the purpose of the study and asked respondents to answer a number of questions by giving an appropriate response. The data gathering process lasts roughly four months (May 2017–August 2017), and the average time for answering the questions of the survey was 23 minutes. A total of 228 complete responses were received from the public administration sector. From this sample, most responses came from the age-groups 30-44 years (26%) and 45-59 years (41%). In terms of gender distribution, the largest proportion of the sample consisted of female employees (59%) while men account for 41% of the sample. When looking at the educational background of respondents, most of them had as a highest academic qualification a degree from a university or other higher-education institution until 4 years (47.4%), while 34.6% had an educational background of over 4 years in higher education (equivalent to master's degree or Ph.D). With regards to salaries, the vast majority of respondents belonged to the 400.000-600.000 Norwegian Kroner (NOK) annual pay-scale, while the next largest group earned between 600.000-800.00 NOK annually. Finally, when looking at leadership responsibilities, the vast majority of the sample stated that they did not have leadership responsibilities (67.1%), 11.4% noted that they had managerial responsibilities, 1.3% that they had personnel responsibilities, and 20.2% that they had both types of responsibilities.

TABLE 1 OVERVIEW OF BIG DATA ANALYTICS CAPABILITIES

	Sample (N=228)	Percentage (%)
Age		
Under 30	27	12%
30-44 years old	59	26%
45-59 years old	93	41%
More than 60 years old	49	21%
Gender		
Female	134	59%
Male	94	41%
Highest Educational Level		
Primary school	1	0.4%
High school	40	17.5%
Higher education (less than 4 years)	79	34.6%
Higher education (more than 4 years)	108	47.4%
Income (Gross annual in Norwegian Kroner)		
Under 200.000	4	1.8%
200.001-400.000	16	7.0%
400.001-600.000	114	50.0%
600.001-800.000	52	22.8%
800.000-1.000.000	18	7.9%
More than 1.000.000	7	3.1%
Do not want to disclose	17	7.5%
Do you hold leadership responsibilities		
Personnel responsibilities	3	1.3%
Managerial responsibilities	26	11.4%
Personnel and managerial responsibilities	46	20.2%
Do not have leadership responsibilities	153	67.1%

To examine the possibility of non-response bias in our sample, the profiles of the respondents from the mailing list were benchmarked against information about the public administration sector and the profiles of people employed from the central statistics bureau. After performing Chi-square analyses on these attributes (e.g. age, educational level), no systematic response bias was detected. Outcomes confirmed that there was no statistically significant difference between the two sub-groups and that the sample of respondents was representative of the population.

B. *Measurements*

To measure the different dimensions that are relevant in examining task-technology fit and individual use, a number of different constructs were used to capture the greatest possible breadth of these categories of variables. All measures were based on prior empirical research and were therefore previously tested in empirical studies. In Appendix A we provide a full list of the questions asked.

When examining attributes relevant to the task itself, we utilized measures that included questions on the types of tasks in which digital technologies were used, the difficulty ad time-criticality of the task, if the level of non-routineness. The types of information we measured under the Task label followed relevant literature examining similar phenomena in IT use in the workplace [33, 34]. Specifically, we measured on a 5-point likert scale the frequency in which respondents used digital technology for core tasks, reporting and documentation tasks, and information/coordination [35]. To determine if they held positions that required leadership skills, we asked respondents to indicate if they had no leadership responsibilities, personnel, managerial, or both. For the purpose of this study, we aggregated as a dichotomous variable leadership with 1 denoting that they had at least one of personnel or managerial, or 0 if they didn't have any leadership responsibility. Finally, to assess the level of non-routineness, we asked respondents to indicate how often they were expected to work outside of paid work hours [36].

With regards to technology-related characteristics we followed a similar approach, looking at different aspects related to functionality and user-friendliness, while also incorporating specific types of devices in the questions that are commonly used by public administration professionals. More specifically, we captured the extent to which respondents believed that digital technologies they used in the jobs were functional and reliable, user-friendly, and flexible and adaptable [37]. Furthermore, we assessed the extent to which respondents need to use different types of devices to perform their work such as personal computers, mobile devices (e.g. smart phones, tablets and portable recording equipment), and wearables (smart glasses, smartwatch/bracelets) [38].

In terms of individual use context, we tried to capture elements that were relevant to how individuals adopt and utilize novel digital technologies within their work place, as well as what types of support mechanisms are set up to facilitate such usage. In congruence with past empirical studies we include aspects that can affect how easily and well individuals utilize digital technology [7]. Specifically, we examine the degree to which individual have a support network from colleagues when using digital technologies, the extent to which they have been trained to use the latest digital technologies in their organizations (e.g. courses, e-learning, self-education through reading), as well as the level to which they have been involved in the joined planning of introducing new digital technologies [39].

Finally, when it comes to examining the impacts of digital technology use in the public administration sector, we examine two opposing depending variables. On the one hand we capture the level to which digital technologies have a positive contribution to work performance. We operationalize this variable as the level to which the quality of work gets better, work is done fast, and the level to which the work performed relies on the use of digital technologies [40]. Since our aims is to also capture configurations that lead to decreased performance, we use separate measures to assess the negative consequences of using digital technologies. Specifically, we develop negative impacts by asking respondents to evaluate the level to which digital technologies have given them a greater workload. Have increased requirements for concentration in work, have resulted in greater time pressure, and have increased stress levels [41].

C. *Measurement Model*

Due to the fact that the model contains primarily formative or single-item constructs, we apply different assessment criteria to evaluate each. First-order formative constructs were assessed in terms of multicollinearity, weights and significance. Since we only had first-order constructs, these values were examined at the construct and item level respectively. All items had positive and significant association with their higher-order constructs. When examining for multicollinearity issues we looked at Variance Inflation Factor (VIF) values, with values above 3.3 being the cut-off threshold [42]. All first order variables had values below the threshold indicating an absence of multicollinearity within our data. Detailed information about the measurement properties of the data can be found in the table below.

TABLE 2 FORMATIVE MEASUREMENT VALIDATION

Construct	Measures	Weight	Significance	VIF
Mobile devices	M1	0.267	p<0.001	2.823
	M2	0.231	p<0.001	2.745
	M3	0.262	p<0.001	2.568
Wearables	W1	0.201	p<0.01	1.643
	W2	0.305	p<0.001	2.844
Training	T1	0.294	p<0.001	2.105
	T2	0.284	p<0.001	2.380
	T3	0.294	p<0.001	2.643
	T4	0.253	p<0.001	2.645
Positive Impact	PI1	0.250	p<0.001	2.111
	PI2	0.373	p<0.001	1.674
	PI3	0.274	p<0.001	1.945
Negative Impact	NI1	0.211	p<0.01	2.745
	NI2	0.304	p<0.001	2.377
	NI3	0.347	p<0.001	2.579
	NI4	0.273	p<0.001	2.201

IV. FINDINGS

To examine what configurations of task, technology, and use practice lead to lead to positive or negative work impact we utilize a fuzzy-set Qualitative Comparative Analysis (fsQCA) approach. FsQCA is a set-theoretic method that in based on Boolean algebra (i.e. set membership) to determine how configurations of elements are linked to specific outcomes. The technique follows the principles of complexity theories and allows for the examination of interplays that develop between elements of a messy and non-linear nature [23]. What makes fsQCA different from other methods of analyzing data is that it supports the notion of equifinality. In essence, equifinality means that a specific outcome (e.g. positive or negative work impacts) may be a result of different configurations of elements, and that these configurations can deviate depending on context or individual use patterns. Applying such an approach is particularly relevant to the case of digital technology usage within the public administration services context, since depending on the type of task, and characteristics of the individual, different digital technologies and use support mechanisms may be more or less relevant in producing positive impacts [43]. Consequently, it is important to understand what configurations of tasks, technologies, and use practices yield most positive impacts, and which most negative ones. Conducting such analyses through FsQCA enables this identification as it is oriented towards reducing elements for each configuration to the fundamentally necessary and sufficient conditions. In addition, fsQCA supports the occurrence of causal asymmetry, which in short means that for an outcome to occur, the presence and absence of a causal condition depend on how this causal condition combines with one or more other causal conditions [23].

As a first step of performing the fsQCA analyses, it is necessary that we calibrate dependent and independent variables into fuzzy or crisp sets. Positive and negative impacts are set as the dependent variables of our study, while the independent variables that are used include those that fall under the categories of task, technology, and individual use context. The only crisp set we have in this analysis in the leadership responsibilities which are coded for 1 if there are is at least the requirement to handle personnel or other managerial matter, or 0 in the absence of such requirements. Contrarily, fuzzy sets in this analysis can range anywhere on the continuous scale from 0, which denotes an absence of set membership, to 1, which indicates full set membership. To calibrate continuous variables such as the ones we have utilized in the survey into fuzzy sets we followed the method proposed by Ragin [44]). Following this procedure, the degree of set membership is based on three anchor values. These include a full set membership threshold value (fuzzy score = 0.95), a full non-membership value (fuzzy score = 0.05), and the crossover point (fuzzy score = 0.50) [45]. Since this study uses a 5-point Likert scale to measure all continuous constructs, we follow the suggestions of Ordanini, et al. [46]) to calibrate them into fuzzy sets. Following these guidelines, and based on prior empirical research (Fiss, 2011; Ragin, 2009), we computed percentiles for each construct so that the upper 25 percentiles serve as the threshold for full membership; the lower 25 percentiles for full non-membership; and the 50 percentiles represent the cross-over point.

A. *Fuzzy set qualitative comparative analyses*

To extract the configurations that lead to positive and negative impacts we relied on the software fsQCA 3.0 [44]. By conducting two separate analyses, the fsQCA algorithm produces truth tables of 2^k rows, where k is the number of predictor elements, and each row indicates a unique possible combination of elements. The fsQCA software then sorts all the 445 observations into each of these rows based on their degree of membership of all the causal conditions. An outcome if this is a truth table where some rows contain several observations while others just a few or even none depending on the collected data. As part of this step it is up to the researcher to reduce the number of rows according to two rules: (1) a row must contain a minimum number of cases, this value was set to a frequency threshold of 5 cases [44]; and (2) selected rows must achieve a minimum consistency level of 0.80. Therefore, configurations that do not fit into these rules are excluded from the analyses. In order to obtain results that explain positive and negative impacts of digital technologies, we use the method proposed by Ragin and Fiss [47]). This method identifies core conditions that are part of both parsimonious and intermediate solutions, and peripheral conditions that are not detectable in the parsimonious solution and only appear in the intermediate solution [23]. Outcomes of the fuzzy set analyses for positive and negative impacts are presented in Table 3. The black circles (●) denote the presence of a condition, while the crossed-out circles (⊗) indicate the absence of it [48]. Core elements of a configuration are marked with large circles, peripheral elements with small ones, and blank spaces are an indication of a don't care situation in which the causal condition may be either present or absent.

TABLE 3 CONFIGURATIONS LEADING TO HIGH AND LOW PERFORMANCE

Configuration	Positive Impacts					Negative Impacts		
	P1	P2	P3	P4	P5	N1	N2	N3
Task								
Core task		●		●		●		
Reporting and documentation task	●				●		●	
Information/Coordination task		●	●		●			●
Leadership	●					●	⊗	●
Non-Routineness			●				●	
Technology								
Reliability		●		●			⊗	
User-friendliness	●	●			●	⊗		⊗
Adaptability/Flexibility			●					⊗

	P1	P2	P3	P4	P5	N1	N2	N3
Personal computer	●				●		●	●
Mobile devices		●	●		●			
Wearables				●		●		
Individual Use Context								
Colleague support					●	●		
Training		●	●			⊗		⊗
Planning participation				●				
Consistency	0.86	0.92	0.88	0.92	0.87	0.90	0.91	0.88
Raw Coverage	0.16	0.19	0.14	0.13	0.14	0.15	0.14	0.14
Unique Coverage	0.11	0.16	0.09	0.07	0.05	0.10	0.06	0.05
Overall Solution Consistency	0.84					0.86		
Overall Solution Coverage	0.38					0.23		

The outcomes of the analysis for positive impacts produce five different solutions. Solutions P1 and P5 present some commonalities but are based on use of different technologies. P1 produces positive impacts for use of personal computers to perform recording and documentations tasks that are characterized by a leadership role. For successful use of such systems a prerequisite is that they are above all user friendly without a need for formal planning and introduction of such technologies. In P2 the utilized technologies are mobile devices for core and information/coordination tasks. Again, user-friendliness is found to be a core contributor to positive impacts of digital technology use, with reliability being another core-condition. Successful adoption of such technologies is coupled with training. Solution P3 concerns mobile devices use for information and coordination tasks. This solution corresponds to employees that do undertake non-routine tasks. Positive impacts in this case result from developing adaptable and flexible technologies and providing support through training for use. P4 on the other had refers to core tasks. Here the used technologies include wearables, with reliability being core characteristics leading to positive impacts combined with participation during planning. Finally, P5 refers to coordination and reporting tasks performed through personal computer and mobile devices. Here we find that for such technologies' user-friendliness and collegial support produce plosive outcomes.

When looking into negative impacts we do not make the assumption that they will be the counter-situation to positive ones, since a series of different elements may coalesce to result in a negative outcome. Negative impacts are realized when for core tasks that are performed by employed with leadership responsibilities, there is an absence of user-friendliness on wearables, and where the preferred method of training is through collegial support and an absence of formal training. In solution N2 which corresponds to personnel that do not have leadership responsibilities and use digital technologies for non-routinized reporting and documentation tasks on personal computers, the absence of reliability leads to negative impacts. Finally, solution N3 concerns information and coordination tasks conducted by employees with leadership responsibilities utilizing personal computers. In these cases, limited flexibility and an absence of a user-friendly environment combined with no training yields negative impacts.

V. Discussion and Conclusion

This study builds on the increased digitization of work practices within the public administration sector and attempts to explore what configurations of tasks, technologies and individual use contexts lead to positive and negative impacts. This study is motivated by the increased embeddedness of work practices with digital technologies and the large amounts invested annually in improving operations by means of such technologies. Nevertheless, the value of such technologies is often questioned, and several studies pinpoint that a lack of any significant impacts, or even negative ones, are due to the fact that there is often a mismatch between what is required, how it is assimilated in operations, and how it is leveraged to support certain tasks [49]. Even more, there are several reports that despite investments in digital technologies in the public sector, there is a denial of use that can be attributed to several reasons, but primarily due to the fact that these technologies make work practices much more arduous and stressful rather than providing any value [50]. While there has been some work on task-technology fit in the public administration environment, the methodologies applied to date do not allow for the exploration of the diverse profile and patterns of use [51]. The goal of this study is to build on the growing literature in the IS domain that adopts a more systemic and holistic perspective in examining task-technology fit and individual use characteristics [13]. We therefore followed a survey-design study approach and collected data from 228 employees from Norway occupying different positions within the public administration sector. By analyzing data through a fsQCA approach we demonstrated that there are several configurations task, technology, and individual use characteristics that can drive positive and negative impacts. This outcome shows that task-specific characteristics and job roles, require a unique mixture of supporting digital technologies and adoption and deployment strategies to yield positive impacts. Similarly, we find patterns of approaches that are consistently producing negative impacts on employees such as reduced productivity and technostress. The value of this study is that it can shed some light on viewing task-technology fit as outcome that is achievable in multiple different ways. Individuals, and their diverse work and task requirements, are likely to require different practices, approaches and technologies to support their work and produce positive results. Through this study we have shown how this can be explored in the public administration sector.

Specifically, our study contributes theoretically by expanding the perspective of task-technology fit and unshackling for research methods that can explain part of the picture. The use of configurational approaches such as that of fsQCA can enable researcher to uncover different configurations of conditions that lead to positive outcomes, providing a renewed, and more individual-specific perspective on how to optimally use digital technologies to enhance work and improve productivity. The findings demonstrate that there are unique combinations of critical factors that contribute to making technology work of public administration service professionals, and that these do not only relate to the technology, but also to its fit with specific tasks, the routinization of work, as well as how organizations plan and diffuse them. This raises the question of how organizations should plan such initiatives to prepare for pre-adoption, and to facilitate continued and optimal usage [52]. From a practical point of view, the results of this study can be used by technology managers to formulate different strategies around digital technologies in the public administration sector. In particular, our results showcase something that is often mentioned by consultants, but that is hardly applied in practice; that there needs to be a greater degree of personalization when planning and deploying digital technologies to support work, particularly in a very information-sensitive, time-critical and low fault tolerant sector such as that of the public administration. It is also quite striking to see that there are several ways in which digital technologies can produce negative impacts to professionals. Such results should prompt professionals to understand why heir digital solutions are creating more of a burden than helping those they were intended for and creating deployment practices that work towards positive impacts.

While the results of this research shed some light on the complex relationships between tasks in the public administration sector, digital technologies, and individual usage characteristics, they must be considered under their limitations. First, the sample of our analysis consists of employees working in Norway. It is probable that individuals that work in other countries may have slightly different configurations of factors that positive impacts since there is likely a cultural effect that could play a role. Second, while we examine positive impacts, we do not look at them specifically. It may be likely that we have a mix of positive impacts and negative ones at the same time. An interesting future direction would see where the optimal balance between the two is and how to achieve that. It is very likely that positive impacts are also accompanied by some negative and more salient ones. Third, although fsQCA allows us to examine the configurations of factors that lead to positive and negative impacts in work performance, the process through which this is done is not well explained. A complementary study suing a qualitative approach would likely reveal more insight on the topic.

REFERENCES

[1] A. Cordella and C. M. Bonina, "A public value perspective for ICT enabled public sector reforms: A theoretical reflection," *Government information quarterly,* vol. 29, no. 4, pp. 512-520, 2012.

[2] I. Troshani, C. Jerram, and S. Rao Hill, "Exploring the public sector adoption of HRIS," *Industrial Management & Data Systems,* vol. 111, no. 3, pp. 470-488, 2011.

[3] P. Seri and A. Zanfei, "The co-evolution of ICT, skills and organization in public administrations: Evidence from new European country-level data," *Structural Change and Economic Dynamics,* vol. 27, pp. 160-176, 2013.

[4] S. H. Bhuiyan, "Modernizing Bangladesh public administration through e-governance: Benefits and challenges," *Government Information Quarterly,* vol. 28, no. 1, pp. 54-65, 2011.

[5] M. Lips, "E-government is dead: Long live public administration 2.0," *Information Polity,* vol. 17, no. 3, 4, pp. 239-250, 2012.

[6] K. Giritli Nygren, "Narratives of ICT and organizational change in public administration," *Gender, Work & Organization,* vol. 19, no. 6, pp. 615-630, 2012.

[7] D. L. Goodhue and R. L. J. M. q. Thompson, "Task-technology fit and individual performance," pp. 213-236, 1995.

[8] M. J. Willis, O. F. El-Gayar, and A. V. J. A. P. Deokar, "Evaluating task-technology fit and user performance for an electronic health record system," p. 327, 2009.

[9] M. J. Kim, N. Chung, C. K. Lee, and M. W. J. I. J. o. T. R. Preis, "Motivations and use context in mobile tourism shopping: Applying contingency and task–technology fit theories," vol. 17, no. 1, pp. 13-24, 2015.

[10] M. Aljukhadar, S. Senecal, J. J. I. Nantel, and Management, "Is more always better? Investigating the task-technology fit theory in an online user context," vol. 51, no. 4, pp. 391-397, 2014.

[11] T. K. Yu and T. Y. J. B. J. o. E. T. Yu, "Modelling the factors that affect individuals' utilisation of online learning systems: An empirical study combining the task technology fit model with the theory of planned behaviour," vol. 41, no. 6, pp. 1003-1017, 2010.

[12] D. M. Strong and O. J. M. q. Volkoff, "Understanding Organization—Enterprise system fit: A path to theorizing the information technology artifact," pp. 731-756, 2010.

[13] B. Furneaux, "Task-technology fit theory: A survey and synopsis of the literature," in *Information systems theory*: Springer, 2012, pp. 87-106.

[14] R. G. Cady, S. M. J. T. Finkelstein, and e-Health, "Task–technology fit of video telehealth for nurses in an outpatient clinic setting," vol. 20, no. 7, pp. 633-639, 2014.

[15] O. Isaac, Z. Abdullah, T. Ramayah, and A. M. Mutahar, "Internet usage, user satisfaction, task-technology fit, and performance impact among public sector employees in Yemen," *The International Journal of Information and Learning Technology,* vol. 34, no. 3, pp. 210-241, 2017.

[16] E. A. Miller, D. M. J. J. o. H. P. West, Policy, and Law, "Where's the revolution? Digital technology and health care in the internet age," vol. 34, no. 2, pp. 261-284, 2009.

[17] M. Kim, R. Sharman, C. P. Cook-Cottone, H. R. Rao, and S. J. Upadhyaya, "Assessing roles of people, technology and structure in emergency management systems: A public sector perspective," *Behaviour & Information Technology,* vol. 31, no. 12, pp. 1147-1160, 2012.

[18] O. Isaac, Z. Abdullah, T. Ramayah, and A. M. Mutahar, "Factors determining user satisfaction of internet usage among public sector employees in Yemen," *International Journal of Technological Learning, Innovation and Development,* vol. 10, no. 1, pp. 37-68, 2018.

[19] P.-L. Wu, S.-S. Yeh, and A. G. Woodside, "Applying complexity theory to deepen service dominant logic: Configural analysis of customer experience-and-outcome assessments of professional services for personal transformations," *Journal of Business Research,* vol. 67, no. 8, pp. 1647-1670, 2014.

[20] O. A. El Sawy, A. Malhotra, Y. Park, and P. A. Pavlou, "Research commentary—seeking the configurations of digital ecodynamics: it takes three to tango," *Information Systems Research,* vol. 21, no. 4, pp. 835-848, 2010.

[21] P. Mikalef and A. Pateli, "Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA," *Journal of Business Research,* vol. 70, pp. 1-16, 2017.

[22] P. Mikalef, M. Boura, G. Lekakos, and J. Krogstie, "Big data analytics and firm performance: Findings from a mixed-method approach," *Journal of Business Research,* vol. 98, pp. 261-276, 2019.

[23] P. C. Fiss, "Building better causal theories: A fuzzy set approach to typologies in organization research," *Academy of Management Journal,* vol. 54, no. 2, pp. 393-420, 2011.

[24] P. J. J. o. S. Reyes-Mercado and I. Technology, "Adoption of fitness wearables: Insights from partial least squares and qualitative comparative analysis," vol. 20, no. 1, pp. 103-127, 2018.

[25] C. K. Or and B.-T. J. J. o. t. A. M. I. A. Karsh, "A systematic review of patient acceptance of consumer health information technology," vol. 16, no. 4, pp. 550-560, 2009.

[26] E. Ammenwerth, C. Iller, C. J. B. m. i. Mahler, and d. making, "IT-adoption and the interaction of task, technology and individuals: a fit framework and a case study," vol. 6, no. 1, p. 3, 2006.

[27] D. Kim, "Adoption of personal information system: Innovation diffusion theory and task-technology fit," in *Allied Academies International Conference. Academy of Management Information and Decision Sciences. Proceedings*, 2009, vol. 13, no. 2: Jordan Whitney Enterprises, Inc, p. 50.

[28] E. T. J. R. o. e. r. Straub, "Understanding technology adoption: Theory and future directions for informal learning," vol. 79, no. 2, pp. 625-649, 2009.

[29] H. Hamidi, A. J. T. Chavoshi, and Informatics, "Analysis of the essential factors for the adoption of mobile learning in higher education: A case study of students of the University of Technology," vol. 35, no. 4, pp. 1053-1070, 2018.

[30] N. Hikmet and S. K. J. I. j. o. m. i. Chen, "An investigation into low mail survey response rates of information technology users in health care organizations," vol. 72, no. 1-3, pp. 29-34, 2003.

[31] D. Straub, M.-C. Boudreau, and D. Gefen, "Validation guidelines for IS positivist research," *The Communications of the Association for Information Systems,* vol. 13, no. 1, p. 63, 2004.

[32] N. Kumar, L. W. Stern, and J. C. Anderson, "Conducting interorganizational research using key informants," *Academy of management journal,* vol. 36, no. 6, pp. 1633-1651, 1993.

[33] J. Gebauer, M. J. Shaw, and M. L. J. J. o. I. T. Gribbins, "Task-technology fit for mobile information systems," vol. 25, no. 3, pp. 259-272, 2010.

[34] I. M. Klopping, E. J. I. T. McKinney, Learning, and P. Journal, "Extending the technology acceptance model and the task-technology fit model to consumer e-commerce," vol. 22, no. 1, 2004.

[35] P. E. Weiseth, B. E. Munkvold, B. Tvedte, and S. Larsen, "The wheel of collaboration tools: a typology for analysis within a holistic framework," in *Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work*, 2006: ACM, pp. 239-248.

[36] S. Cane and R. J. J. o. C. I. S. McCarthy, "Analyzing the factors that affect information systems use: a task-technology fit meta-analysis," vol. 50, no. 1, pp. 108-123, 2009.

[37] T.-C. J. C. C. Lin, Informatics, Nursing, "Mobile nursing information system utilization: the task-technology fit perspective," vol. 32, no. 3, pp. 129-137, 2014.

[38] D. Metcalf, S. T. Milliard, M. Gomez, and M. J. I. p. Schwartz, "Wearables and the internet of things for health: Wearable, interconnected devices promise more efficient and comprehensive health care," vol. 7, no. 5, pp. 35-39, 2016.

[39] J.-L. Hsiao and R.-F. J. C. C. Chen, Informatics, Nursing, "An investigation on task-technology fit of mobile nursing information systems for nursing performance," vol. 30, no. 5, pp. 265-273, 2012.

[40] S. Chung, K. Y. Lee, K. J. I. Kim, and Management, "Job performance through mobile enterprise systems: The role of organizational agility, location independence, and task characteristics," vol. 51, no. 6, pp. 605-617, 2014.

[41] A. Gupta, H. Li, and R. J. D. S. S. Sharda, "Should I send this message? Understanding the impact of interruptions, social hierarchy and perceived task complexity on user performance and perceived workload," vol. 55, no. 1, pp. 135-145, 2013.

[42] S. Petter, D. Straub, and A. Rai, "Specifying formative constructs in information systems research," *MIS quarterly,* pp. 623-656, 2007.

[43] J. M. Holroyd-Leduc, D. Lorenzetti, S. E. Straus, L. Sykes, and H. J. J. o. t. A. M. I. A. Quan, "The impact of the electronic medical record on structure, process, and outcomes within primary care: a systematic review of the evidence," vol. 18, no. 6, pp. 732-737, 2011.

[44] C. C. Ragin, "Qualitative comparative analysis using fuzzy sets (fsQCA)," *Configurational comparative methods,* vol. 51, 2009.

[45] A. G. Woodside, "Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory," ed: Elsevier, 2013.

[46] A. Ordanini, A. Parasuraman, and G. Rubera, "When the recipe is more important than the ingredients: A qualitative comparative analysis (QCA) of service innovation configurations," *Journal of Service Research,* vol. 17, no. 2, pp. 134-149, 2014.

[47] C. C. Ragin and P. C. Fiss, "Net effects analysis versus configurational analysis: An empirical demonstration," *Redesigning social inquiry: Fuzzy sets and beyond,* pp. 190-212, 2008.

[48] P. Mikalef, A. Pateli, R. S. Batenburg, and R. v. d. Wetering, "Purchasing alignment under multiple contingencies: a configuration theory approach," *Industrial Management & Data Systems,* vol. 115, no. 4, pp. 625-645, 2015.

[49] M. Tarafdar, A. Gupta, and O. J. I. S. J. Turel, "The dark side of information technology use," vol. 23, no. 3, pp. 269-275, 2013.

[50] F. Bannister and R. Connolly, "ICT, public values and transformative government: A framework and programme for research," *Government Information Quarterly,* vol. 31, no. 1, pp. 119-128, 2014.

[51] J. Mtingwi and J.-P. Van Belle, "E-government status and m-government readiness in Malawi," in *E-government implementation and practice in developing countries*: IGI Global, 2013, pp. 211-241.

[52] P. Mikalef, M. Boura, G. Lekakos, and J. J. B. J. o. M. Krogstie, "Big data analytics capabilities and innovation: the mediating role of dynamic capabilities and moderating effect of the environment," vol. 30, no. 2, pp. 272-298, 2019.

APPENDIX A. SURVEY INSTRUMENT

Constructs and Questions
Tasks
Please rate the extent to which digital technology is used in the following types of work (1 to a low extent – 5 to a high extent) - Core tasks - Reporting and documentation tasks - Information and coordination tasks
Do you have any leadership responsibility where you work? Please select the one that fits best - Yes, personnel - Yes, managerial - Yes, both types (from the above) - No, I do not
Do you feel that you are expected to use digital technologies outside of work hours? (1 never, 5 yes often/always)
Technology
Please rate the extent to which the digital technologies that are used in the job most are (1 to a low extent – 5 to a high extent): - Reliable - User-friendly - Flexible and works fast
To what extent to you use the following in your work (1 to a low extent – 5 to a high extent): - Personal computer - Smart phone - Tablet - Smart glasses - Smartwatch/bracelet
Individual Use Context
Do you receive support and assistance from your colleagues in using digital technologies if needed? (1 Never – 5 Always/Very often)
To what extent do you use the following types of training for the digital technologies you use in your workplace? (1 to a low extent – 5 to a high extent): - Courses - Own reading/Using internet - Through colleague mentors - Have received digital-based education (e.g. e-learning, games)
To what extent are you involved when planning and introducing new digital technologies (1 to a low extent – 5 to a high extent)
Positive Impact
To what extent do the latest digital technologies contribute to your work? (1 to a low extent – 5 to a high extent): - Increased quality of work - Work is done faster - Work is done which could not be completed without such tools
Negative Impact
To what extent have digital technologies resulted in the following outcomes? (1 to a low extent – 5 to a high extent): - Digital technologies have given me a greater workload - Digital technologies have increased the requirements for concentration in work - Digital technologies have resulted in greater time pressure in my work - Digital technologies have increased my stress level